



Magnum Workgroup Hubs

“Ten Series”

Models 1008, 1016 and 1024



Installation and User Guide

Magnum™ 1008, 1016 and 1024

and optional 48VDC, 24VDC & 125VDC-powered models

Workgroup Hubs

Installation and User Guide

Part #: 84-00030 Rev 04/02

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NEBS is a trademark of Telcordia Technologies

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Important: The Magnum 1000 series workgroup hub family contains no user serviceable parts. Attempted service by unauthorized personnel shall render all warranties null and void. If problems are experienced with Magnum 1000 series workgroup hub products, consult Section 5, Troubleshooting, of this User Guide.

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Federal Communications Commission

Radio Frequency Interference Statement

This equipment generates, uses and can radiate frequency energy and if not installed and used properly, that is in strict accordance with the manufacturer's instructions, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

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Rev D 04/02 : Included Power Budget calculation and Rack mounting as well as updated Appendix B with 24VDC & 125VDC option.

Rev C 04/01 : Change the company name to GarrettCom, Inc. (Formerly it was Garrett Communications). There are no changes to the content of the material at this time

Rev B 06/99: This revision changed the company address to the new location and added the 48V Appendix B.

Rev A 06/95 : This revision is the initial release of the Magnum 1000 user manual

The Magnum Line

ETHERNET CONNECTIVITY PRODUCTS

"DESIGNED AND MANUFACTURED IN THE USA"

OVERVIEW

GarrettCom, Inc. offers the premium-quality Magnum™ line of Ethernet LAN connectivity products with industry-standard functionality and built-in fiber configurability. Magnum products are designed for use in demanding Carrier Class, Industrial Grade and OEM applications where reliability is a primary consideration.

4K-Series Switches, 100 & 10Mbps, copper ports with optional fiber port, with auto-negotiating full switching performance

Quad-Series Fiber Switches, 100 & 10Mbps, fiber and copper ports, mixed-speed and mixed-media types, full switching Performance

"Outdoor" Ethernet Switch, for temperature uncontrolled locations
6 10/100 and 2 100Mb fiber ports, can be connected in strings

Mixed-Media Fiber Hub, 16-port Stackable, 10/100 auto-sensing

Dual Speed 8-port and 16-port Stackables, 10/100 auto-sensing
Stackable Hubs, SNMP Optional

10Mb series and 100Mb series, both w/ optional port modules

Personal Switches, 10/100Mb

8 port dual speed, Auto-negotiable with fiber option

Personal Hubs, 100Mb or 10/100Mb

8-port, with two switched ports (1 fiber built in)

Personal Hubs, 10Mb series

8-port + AUI, stackable to 5 high, + optional BNC of fiber port
8 or 9-port and 4 or 5-Port Personal Hubs, w/ man. up-link sw.

Media Converters, 10Mb and 100Mb series

All media combinations, incl. fiber ST, SC, mm., single mode

The "X-line" of configurable MiXed Media products:

Stackable Concentrators, SNMP optional, 13-Ports

Mini-Concentrators, 7 Ports, Repeaters, 2-Ports

Repeater Port Modules (RPMs), 6 types for Ethernet media

Bridge Port Modules (BPMs), 4 types, for segment isolation

Fan-Outs, 10Mb series

2, 4 and 8 Port Models

Transceivers, 10Mb and 100Mb series 10Mb Mini-Transceivers
and Coax Models, All Types -

Apr, 02

1.0 SPECIFICATIONS

1.1 Technical Specifications

Performance

Data Rate: 10Mbps / sec

Partitioning: Enforced after 32 consecutive collisions.

Reconnect: Occurs after 512 bits of error-free transmission.

Network Standards

Ethernet V1.0/V2.0 IEEE 802.3: 10BASE-T, 10BASE5, 10BASE2, 10BASE-FL & FOIRL.

(Magnum Workgroup Hubs are physical layer standard Ethernet products, and operate independently of all software.)

Maximum Ethernet Segment Lengths

DTE (AUI Drop Cable)	- 50 m (164 ft)
10BASE-T (twisted pair)	- 100 m (328 ft)
Shielded twisted pair	- 150m (492 ft)
10BASE2 ThinNet (BNC)	- 185 m (607 ft)
10BASE5 ThickNet	- 500 m (1,640 ft)
FOIRL multi-mode Fiber optic	- 1 km (3,281 ft)
10BASE-FL multi-mode Fiber optic	- 2 km (6,562 ft)
Single-mode Fiber optic	- 10 km (32,810 ft)

Connectors

TP : RJ-45 shielded, female

AUI: D-sub 15-pin female with slide lock

Other Media: via Port Modules

AC Power: IEC recessed male

Switches

Port 1, up-link switch for repeater-to-repeater connections.

LEDs

PWR (AC power on), ACT (common activity indicator), LINK (per port)

Operating Environment

Ambient Temperature: 32° to 120° F (0° to 50°C)

Storage Temperature: -5° to 140°F (-20° to 60°C)

Ambient Relative Humidity: 10% to 95% (non-condensing)

Packaging

Enclosure: High strength metal. Suitable for wiring closet shelf, desktop, or rack-mounting.

Dimensions: 1008: [8.5 x 7.75 x 1.75] in, [21.6 x 19.7 x 4.5] cm

1016 & 1024: [17.0 x 7.5 x 1.75] in, [43.2 x 19.1 x 4.5] cm

Weight: 1008: 3.4 lbs, 1.6 kg

1016: 3.1 lbs, 1.4 kg

1024: 3.3 lbs, 1.5 kg

Cooling method: Convection

Power Supply (Internal)

AC Power Connector: IEC-type, male recessed, rear of chassis

Input Voltage: 90 to 260 VAC (auto-ranging)

Input Frequency: 47 to 63 Hz (auto-ranging)

Power Consumption: 10 watts typical, 20 watts max. P.S. rating

(For 48VDC power input option, see Appendix B).**Agency Approvals**

UL Listed (UL 1950), cUL, CE

Emissions meet FCC Part 15 Class A

Warranty

Three years, return to factory

Made in USA

1.2 Specifications - Repeater Port Modules (RPMs)

RPM Type :	BNC	AUI	DTE	Fiber-mm	Fiber-sgl.m	TP*
Front Access	yes	yes	yes	yes	yes	yes
Connector Type	BNC-f	DB-15 f	DB-15 m	Fiber-ST	Fiber-ST	RJ-45
Partition (PART)LED	yes	yes	yes	yes	yes	yes
Receive (RX) LED	yes	yes	yes	yes	yes	yes
LINK LED	n.a.	n.a.	n.a.	yes	yes	yes
Switch on Face Plate	yes**	n.a.	n.a.	n.a.	n.a.	

yes***

“Fiber-mm” is multi-mode cable, normally used for 10BASE-FL installations, up to 2.0Km.

“Fiber-sgl.m” is single-mode cable, used for distant installations, up to 10.0Km.

* The RJ-45 connector is shielded; it accepts RJ-45 eight-pin plugs for unshielded and shielded twisted pair wiring.

** Internal termination switch for BNC, no "T" connector is required.

*** MDI-X (Media Dependent Interface - Crossover) switch for RJ-45 up-link, no crossover cable is required.

1.3 Specifications - Bridge Port Modules (BPMs)

BPM Type :	BNC	AUI	Fiber	TP*
Connector Type	BNC(f)	DB-15(f)	ST	RJ-45
Switch on FP	yes**	n.a.	n.a.	yes***
FWD-I LED	yes	yes	yes	yes
FWD-X LED	yes	yes	yes	yes
LINK LED	n.a.	n.a.	yes	yes

* The RJ-45 connector is shielded; it accepts RJ-45 eight-pin plugs for unshielded and shielded twisted pair wiring.

** Internal termination switch for BNC, no "T" connector is required.

*** MDI-X (Media Dependent Interface - Crossover) switch for RJ-45 up-link, no crossover cable is required.

1.4 Ordering Information**Magnum 1000 Workgroup Hubs**

- Magnum 1008** Eight port 10BASE-T Hub with shielded RJ-45 connectors and front-mounted LEDs. Includes a basic AUI port in the rear; may optionally be ordered instead with an RPM or BPM in the rear port slot. Internal universal power supply, up-link switch on port 1. Stand-alone package, rack-mount brackets optional.
- Magnum 1016** 16 port 10BASE-T Hub with shielded RJ-45 connectors and front-mounted LEDs. Includes a basic AUI port in the rear and one rear bonus slot for an optional RPM or BPM to be configured. Internal universal power supply, up-link switch on port 1. Stand-alone or rack-mount; brackets (ears) included.
- Magnum 1024** 24 port 10BASE-T Hub with shielded RJ-45 connectors and front-mounted LEDs. Includes a basic AUI port in the rear and one rear bonus slot for an optional RPM or BPM to be configured. Internal universal power supply, up-link switch on port 1. Stand-alone or rack-mount; brackets (ears) included.
- Magnum 10xx-pm** Designates a port module (RPM or BPM) to be factory installed in the applicable rear-mounted bonus slot. (Note that the designated port module option, an RPM or a BPM, must also be purchased as a line item.)
- Magnum 10xx-48V** Designates optional 48VDC power supply to be factory installed in the chassis, see Appendix B.

GarrettCom, Inc. reserves the right to change specifications, performance characteristics and/or model offerings without notice.

2.0 INTRODUCTION

2.1 Inspecting the Package and Product

Examine the shipping container for obvious damage prior to installing this product; notify the carrier of any damage which you believe occurred during shipment or delivery. Inspect the contents of this package for any signs of damage and ensure that the items listed below are included.

This package should contain:

- 1 Magnum 1008, 1016 or 1024 Workgroup Hub
- 1 Set of metal “ears” for optional rack-mounting (Models 1016, 1024 only)
- 1 AC Power Cord (U.S. and other 115 VAC only)
- 1 Installation and User Guide
- 1 Product Registration Card

Remove the items from the shipping container. Be sure to keep the shipping container should you need to ship the unit at a later date. To validate the product warranty please complete and return the enclosed Product Registration Card to GarrettCom, Inc. as soon as possible.

In the event there are items missing or damaged, contact the party from whom you purchased the product. If the unit needs to be returned, please use the original shipping container if possible. Refer to Section 5, Troubleshooting, for specific return procedures.

2.2 Product Description - Magnum 1000-series Workgroup Hubs

Magnum 1000 Workgroup Hubs are full-featured 10BASE-T Ethernet hubs. Magnum 1000 Hubs provide a low cost, flexible solution for networking a small workgroup or for adding additional nodes to an existing network via twisted pair cabling. Magnum 1000 Hubs are well suited for small- to medium-size facilities requiring an independent Ethernet network, and will operate as self-sufficient devices to provide 10BASE-T Ethernet connectivity for all local users and devices. Small independent networks built using Magnum 1000 Hubs are easily expanded by cascading, adding hubs of the same or similar types to grow the network.

The family of Magnum 1000 Workgroup Hubs is comprised of Models 1008 (pronounced “ten oh-eight”), 1016 (“ten sixteen”) and 1024 (“ten twenty-four”). These models are equipped with 8, 16 or 24 front-mounted, shielded RJ-45 ports, respectively. Magnum 1000 Workgroup Hubs support full Ethernet segment lengths and operate in compliance with the IEEE 802.3 specification for repeater functionality to perform signal amplification, re-timing, and regeneration of preamble bits for each packet received. Consistent with IEEE 802.3 specifications, Magnum 1000 Hubs will detect collisions, generate jam signals, extend collision fragments, and automatically partition and re-connect individual ports.

For models with optional 48V DC power supply built in, see Appendix B.

2.2.1 Magnum 1008 Workgroup Hub

The Magnum 1008 Workgroup Hub, shown in Figure 2.2.1a, has eight front-mounted, shielded RJ-45 ports and one rear-mounted AUI port. The left-most RJ-45 port (port 1) is equipped with a slide switch to allow cascading or an up-link without a crossover cable. Refer to section 3.3.1 for details about the up-link switch.

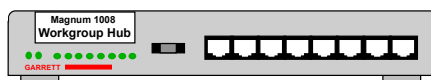


Figure 2.2.1a: Front view - Magnum 1008 Workgroup Hub

Status LEDs are located on the front panel of the Magnum 1008 for convenient monitoring of PWR, ACT (Activity) and LINK (per port). Magnum 1008s have an auto-ranging internal power supply, and are suitable for table-top-, wall-, or rack-mounting. Optional rack-mount brackets may be ordered, part number 1008-RMB.

Figure 2.2.1b shows the rear-mounted AUI port. This is the base or default configuration for the Magnum 1008. The basic AUI (standard female) port may be used for a direct connection with an AUI drop cable or for connection to any media type via an external mini-transceiver.

When using standard AUI cabling to connect to other Ethernet devices, it is important to consider the AUI segment length, including any cascading. Refer to Section 3.3.2 for detailed information on the AUI port, connector pins and standard cable length requirements.

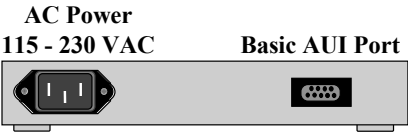


Figure 2.2.1b: Rear view - Magnum 1008 Workgroup Hub with the basic AUI port

As an alternative to the basic AUI port, it is possible (at the time of initial order) to replace the basic AUI rear port with any Magnum Port Module (PM). (See Figure 2.2.1c). This option gives the Magnum 1008 great flexibility to easily conform to any standard Ethernet media environment. When configured with a Repeater Port Module (RPM), the rear port can be used for direct connection to any standard Ethernet media. With a Bridge Port Module (BPM), the rear port is used to bridge-isolate the Magnum 1008 from the rest of the network, increasing bandwidth for both the local users and the rest of the network. Refer to Section 2.4 for Magnum Port Module information. (NOTE: The Magnum 1008's basic AUI port is *NOT* an RPM-AUI, it is simply an AUI port without any LEDs).

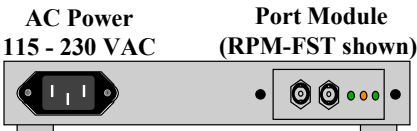


Figure 2.2.1c: Rear view - Magnum 1008 Workgroup Hub configured with PM

2.2.2 Magnum 1016 and 1024 Workgroup Hubs

The Magnum 1016 Workgroup Hub is equipped with 16 front-mounted, shielded RJ-45 ports, 1 rear-mounted basic AUI port and 1 rear Bonus Port slot (see Figure 2.2.2a). The left-most front RJ-45 port (port 1) is equipped with a slide switch to allow cascading or an up-link without a crossover cable.

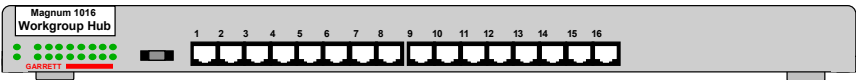


Figure 2.2.2a: Front view - Magnum 1016 Workgroup Hub

The Magnum 1024 Workgroup Hub is equipped with 24 front-mounted, shielded RJ-45 ports, 1 rear-mounted AUI port and 1 rear Bonus Port slot (see Figure 2.2.2b).



Figure 2.2.2b: Front view - Magnum 1024 Workgroup Hub

In the rear, the basic AUI (standard female) port, shown in Figure 2.2.2c, may be used for a direct connection with an AUI drop cable or for connection to any media type via an external mini-transceiver. When using standard AUI cabling to connect to other Ethernet devices, it is important to consider the AUI segment length, including any cascading. Refer to Section 3.3.2 for detailed information on the basic AUI port, connector pins and standard cable length requirements. (NOTE: The basic AUI port is *NOT* an RPM-AUI, it is simply an AUI port without any LEDs.)

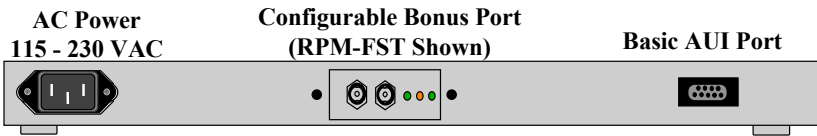


Figure 2.2.2c: Rear view - Magnum 1016 and 1024 Workgroup Hubs

The Bonus Port slot of a Magnum 1016 or 1024, shown in Figure 2.2.2c, may be optionally configured with any Magnum Port Module (PM). This option gives the Magnum 1016s and 1024s great flexibility to easily conform to any standard Ethernet media environment. When configured with a Repeater Port Module (RPM), the rear port can be used for direct connection to any standard Ethernet media. With a Bridge Port Module (BPM), the rear port is used to bridge-isolate the Magnum hub from the rest of the network, increasing bandwidth for both the local users and the rest of the network. Refer to Section 2.4 for Magnum Port Module information.

Status LEDs are located on the front panel of both the 1016 and 1024 for convenient monitoring of PWR, ACT and LINK (per port). Magnum 1016 and 1024 hubs have auto-ranging internal power supplies, are suitable for table-top-, wall-, or rack-mounting. Rack-mount “ears” are supplied with both the Magnum 1016 and Magnum 1024 Workgroup Hubs.

2.3 Internal Connections, basic AUI Port and Port Modules

Figure 2.3a shows the internal layout of the Magnum 1008 for each of the two rear port configuration options (see section 2.2.1). Unless otherwise specified at the time of order, the Magnum 1008 is shipped with a basic AUI port. For greater application flexibility, any of the Magnum PMs may be specified at the time of order for factory configuration. It is also possible for the rear port to be re-configured in the field by a trained technician to exchange or add Port Modules.

NOTE: When changing from the basic AUI port to a Port Module option in the field, it is necessary to have a Port Module connector cable (part number CBL-PM available as a spare part from GCI) in addition to the desired PM.

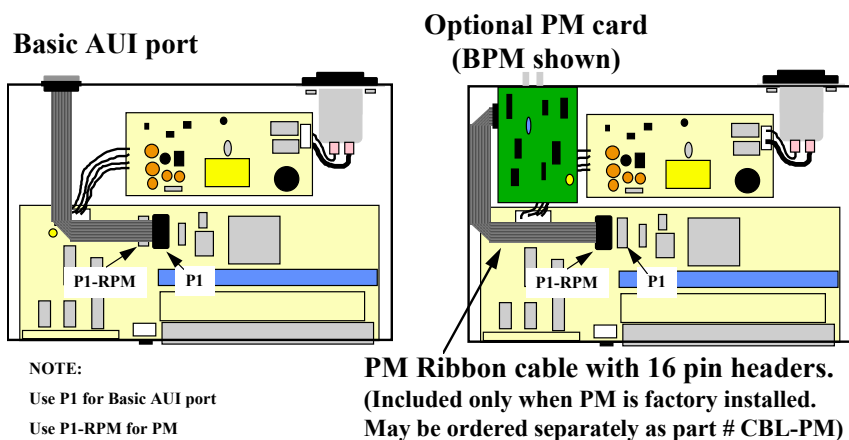
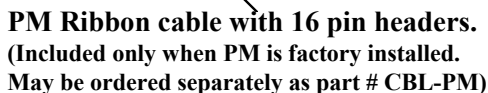


Figure 2.3a: Model 1008 Internal Connections, Basic AUI port and Port Module

Figure 2.3b shows the internal layout of the Magnum 1016 and 1024 Workgroup Hubs. (The Model 1024 is shown in the figure, but all rear port connections are identical for the Model 1016). One rear port always has the basic AUI port in it. The bonus port slot, in the center of the chassis rear, is available for configuring any PM. For application flexibility, any of the Magnum PMs may be specified on an order for factory configuration in the bonus port slot. It is also possible for the bonus port to be re-configured in the field by a trained technician to exchange or add Port Modules.

NOTE: When adding a Port Module option to the Bonus Port slot in the field, it is necessary to have a Port Module connector cable (part # CBL-PM available as a spare part from GCI) in addition to the desired PM. See also Section 2.4.12, Special Option.



BPMs are available for the following four Ethernet media connector types: BNC (ThinNet or 10BASE2), AUI (10BASE5 or ThickNet, DB-15 female for most transceiver connections), ST (Ethernet multi-mode Fiber ST), and RJ-45 (10BASE-T UTP and STP). They are shown in Figure 2.4b.

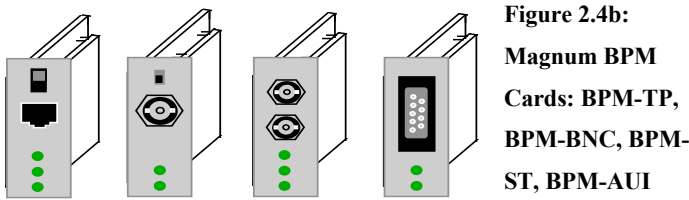


Figure 2.4b:
Magnum BPM
Cards: BPM-TP,
BPM-BNC, BPM-
ST, BPM-AUI

Magnum Port Modules provide an optional electronic assembly and media connector for the Magnum 1000 Hubs’ bonus port slots, and are not functional as stand-alone units. Figure 2.4c shows the physical dimensions of the Port Modules.

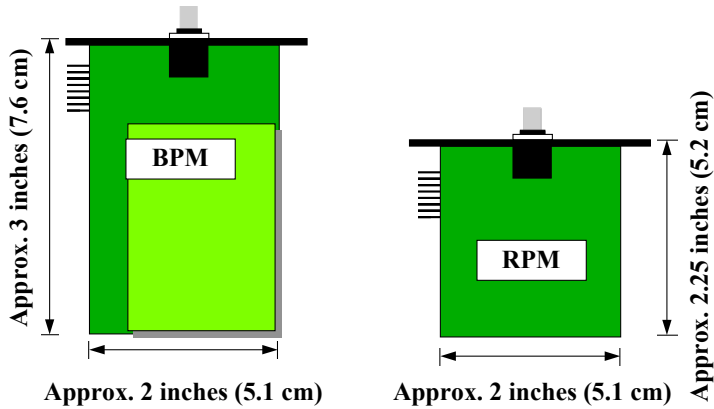


Figure 2.4c: Physical Dimensions of Magnum Port Modules

Each Port Module is normally factory installed in Magnum 1000 Hub units. Alternatively, PMs may sometimes be installed in the field by a trained technician.

The following is a detailed description of each Port Module.

2.4.1 RPM-BNC

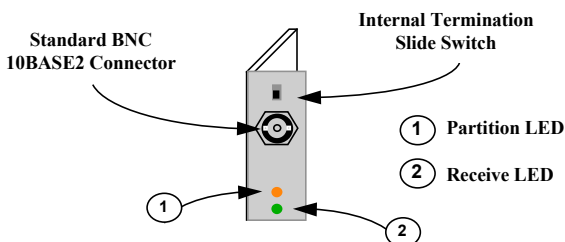
The Magnum RPM-BNC repeater module is equipped with a standard 10BASE2 coax connector. This RPM performs full IEEE 802.3 repeater functionality and is used for 10BASE2 ThinNet (commonly referred to as BNC) connections.

The RPM-BNC module is designed with a special switch-selectable internal termination function that eliminates the need for a "tee" connector and a 50 ohm terminator. To take advantage of internal termination, the slide switch should be in the "DOWN" (or right-side) position. In this configuration, the 10BASE2 segment is directly attached to the BNC port where it is internally terminated. When the switch is in the "UP" (or left-side)

position, the BNC port requires a "tee" connector (not supplied) and a 50 ohm terminator for proper termination.

Certain applications may require a "tee" connector,

used as a tap, to allow the 10BASE2 coax segment to continue on past the RPM-BNC connection.



Magnum BPM-BNC

The RPM-BNC module includes one partition (PART) and one receive (RX) LED, which are visible from the exterior. (The PART LED is inoperative on Model 1000 Hubs because the logic necessary to drive the LED is not included in the design.) The RX LED illuminates GREEN intermittently to indicate data is being received.

Important Note: for the RPM-BNC Termination Switch -
DOWN (or right): Internally Terminated
UP (or left): Requires "T" Connector.

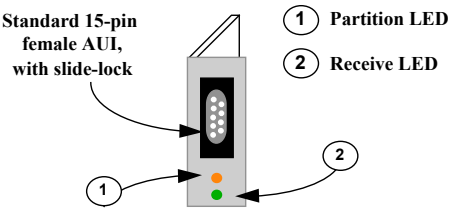
2.4.2 RPM-AUI

This module is equipped with a 15 pin female AUI connector and a slide-lock, and performs full IEEE 802.3 repeater functionality. It is used to provide connectivity with a 10BASE5 (ThickNet) backbone or to any AUI segments. A transceiver is required when connecting to a ThickNet segment and the RPM-AUI supports this convention. The RPM-AUI is also a "universal" Ethernet media interface as it may be

used with a variety of different mini-transceivers to provide connectivity to any media type.

The RPM-AUI card is equipped with Partition (PART) and Receive (RX) LEDs. The RX LED functions the same as the RX LEDs of the RPM-BNC. The PART LED is inoperative on Model 1000 Workgroup Hubs. (Section 2.4.1 above).

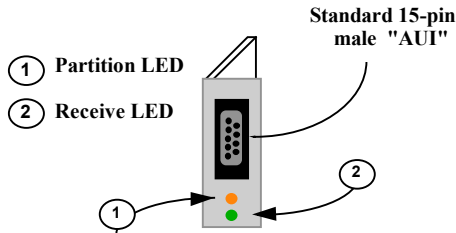
The Magnum RPM-AUI card is also used for connecting Ethernet devices using standard AUI cabling. In this situation, it is important to consider the AUI segment length or distance to the attached device, including any cascading. Refer to Section 3.3.2 for detailed information on the AUI port, connector pins, and cable length requirements.



Magnum RPM-AUI

2.4.3 RPM-DTE

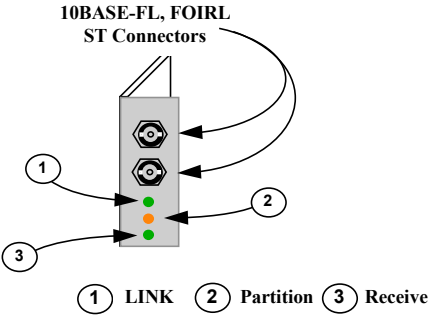
The Magnum RPM-DTE is a module equipped with a 15-pin male DTE connector with lock posts. (The RPM-DTE is a mating connector for the RPM-AUI which has a 15-pin female connector and slide locks. The pin assignments of the two are the same). The RPM-DTE card is designed to support direct connections (no transceiver required) using AUI drop cables to any device that is equipped with an AUI port. Examples of such devices include servers, routers, bridges, hubs, and UNIX workstations.



Magnum RPM-DTE

2.4.4 RPM-FST (Fiber ST, Twist-lock Connector)

The Magnum RPM-FST is a multi-mode fiber optic module equipped with a dual ST-type connector. It functions as an IEEE 802.3 full repeater to support 10BASE-FL and FOIRL network segments. When used for 10BASE-FL segments, this module supports fiber optic transmission distances up to 2000m. For FOIRL applications, it supports fiber segments of up to 1000m in length. The RPM-FST includes full transceiver functionality and does not require an external transceiver device. In addition to Partition (which is inoperative on Model 1000 Hubs) and Receive (RX) LEDs, a LINK LED indicates proper



Magnum RPM-FST connectivity with the remote device.

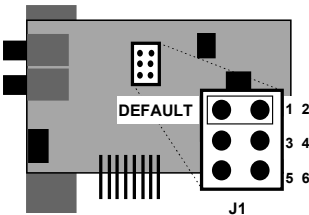
NOTE: The RPM-FST circuit board contains a six pin jumper which controls the intensity of the transmitted signal. By default, the jumper is placed across pins 1 and 2. The jumper may be set as follows to accommodate distances of up to 4 km:

JUMPER ACROSS DISTANCES
SUPPORTED

1 - 2	0 - 2 km*
3 - 4	0.5 - 3 km**
5 - 6	1.5 - 4 km**

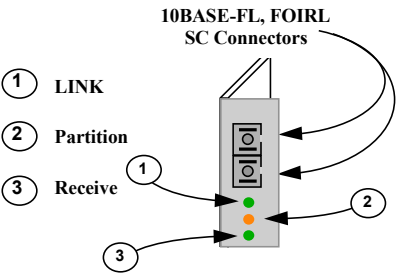
* When distances of less than 2 km are needed, the jumper should be placed across pins 1 and 2.

** When fiber cable distances of more than 2 km are selected, the minimum cable length must also be increased, as shown in the table above.



2.4.5 RPM-FSC(Fiber SC, Snap-in Connector)

The Magnum RPM-FSC is also a multi-mode fiber optic repeater module. Its functionality is exactly like the RPM-FST, but it is equipped with an SC-type "snap-in" connector. Please refer back to section 2.4.4 for details.

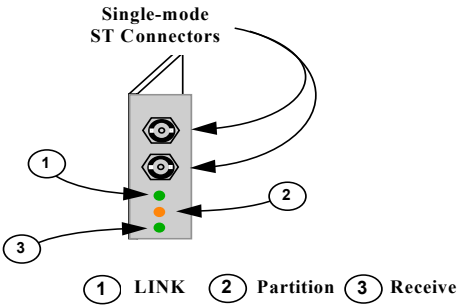


Magnum RPM-FSC

2.4.6 RPM-SMF (Single-mode Fiber)

The Magnum RPM-SMF is a single-mode fiber optic module equipped with a dual ST-type connector. It functions as a full repeater to support single-mode fiber networks. The RPM-SMF supports fiber optic transmission distances of up to 10 Km. The RPM-SMF includes full transceiver functionality and does not require an external transceiver device.

This module is equipped with PART, RX, and LINK LEDs identical to those of the RPM-FST. To distinguish the single-mode RPM-SMF from the multi-mode



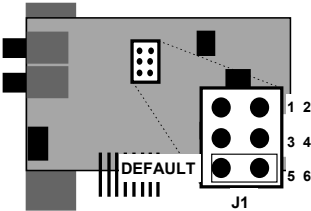
Magnum RPM-SMF

RPM-FST, the label “Sgl. M.” is at the top of the faceplate of the RPM-SMF. As an additional indicator, a multi-mode TX port emits light (red in color) that is in the visible spectrum and which can be seen by looking into the port with the power on and with no cable connected. The single-mode TX port emits light outside of the visible spectrum and will always look dark to the human eye.

Note: Be sure to use single-mode fiber optic cable with this module (see Section 3.8.9). Single-mode fiber cable has a smaller diameter than multi-mode fiber cable (2/15 - 8/60 microns for single-mode, 50/125 or 62.5/125 microns for multi-mode, where xx/xx are the diameters of the core and the core plus the cladding respectively).

NOTE: The RPM-SMF circuit board contains a six-pins (three positions) jumper, but the jumper is only to be placed across pins 5 & 6 for single-mode. The other jumper positions are not used for single-mode fiber.

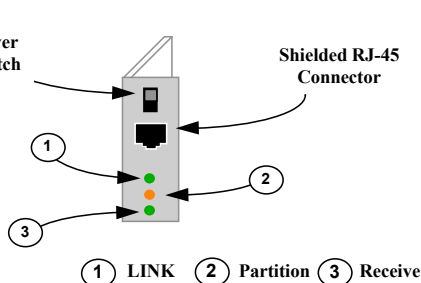
<u>JUMPER ACROSS</u>	<u>DISTANCES</u> <u>SUPPORTED</u>
1 - 2	not used
3 - 4	not used
5 - 6	0 - 10 km



2.4.7 RPM-TP (Twisted Pair)

The Magnum RPM-TP card supports Ethernet twisted pair segments of any standard length. It is equipped with a single RJ-45 connector. The RJ-45 connector is shielded to minimize emissions and will allow both unshielded twisted pair (UTP) and shielded twisted pair (STP) segment connections.

The RPM-TP module is also equipped with a slide switch to allow for cascaded or up-link connections. This feature eliminates the need for a special twisted pair crossover cable.



Magnum RPM-TP

With the switch in the UP position, the RPM-TP port is used for up-link connections (i.e.: a connection to another repeater or hub typically.) When used for segments going to workstations and other user device connections, the switch should be in the DOWN position. Proper switch position can be verified by noting that the port's LINK LED will illuminate when proper link is established.

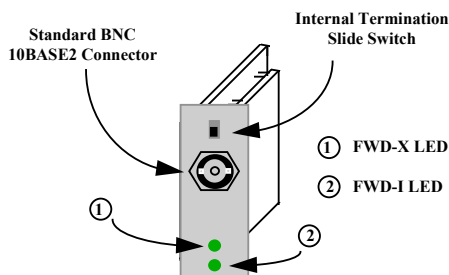
The RPM-TP will support 10BASE-T unshielded twisted pair wiring (UTP) environments with maximum segment distances up to 100m (325 ft.), or shielded twisted pair wiring (STP) of 150m (500 ft.). This module is designed with internal transceiver functionality. The RPM-TP has LINK, PART (inoperative on Model 1000 Hubs), and RX LEDs.

Important Note: For the RPM-TP MDI-X Crossover Switch -
DOWN(or Right) for workstations and user connections.
UP (or Left) for Up-Link connections to other hubs, etc.

The RJ-45 pins normally (TP crossover switch DOWN) are per the standard for hubs-to-users twisted pair wiring: 1 = receive+, 2 = receive-, 3 = transmit+, 6 = transmit-, other pins not used. When the TP crossover switch is UP, the pins of the RJ-45 port are per the standard for up-links using twisted pair wiring, i.e., the transmit and the receive pairs are exchanged: 1 = transmit+, 2 = transmit-, 3 = receive+, 6 = receive-, other pins not used.

2.4.8 BPM-BNC

The Magnum BPM-BNC bridge module is equipped with a standard 10BASE2 coax connector. This BPM is self-learning and filters and forwards packets at full Ethernet wire speed. This module is used for 10BASE2 ThinNet (commonly referred to as BNC) connections and is



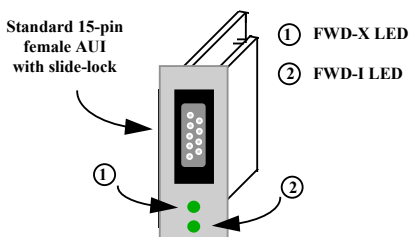
Magnum BPM-BNC

designed to isolate the local segment (i.e., the users and devices connected to the Magnum unit housing the BPM) from the connecting network (i.e., the users and devices connected through the BPM's media connector).

The BPM-BNC module is designed with a special switch -selectable internal termination function that eliminates the need for a "tee" connector and a 50 ohm terminator. For switch details, refer to RPM-BNC, section 2.4.1. The BPM-BNC module includes an FWD-I LED and an FWD-X LED, which are visible from the exterior. The FWD-I LED blinks GREEN to indicate that packets are being forwarded INTO the local Magnum hub. The FWD-X LED blinks GREEN to indicate that packets are being forwarded OUT of the local Magnum hub.

2.4.9 BPM-AUI

This local-bridge module is equipped with a 15 pin female AUI connector and a slide-lock. It is self-learning and filters and forwards packets at full Ethernet wire speed. It is used to provide segment isolation from a 10BASE5 (ThickNet) backbone or any



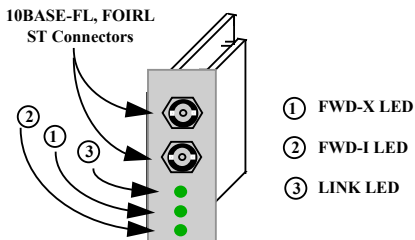
Magnum BPM-AUI

AUI segment. A transceiver is required when connecting to a ThickNet segment and the BPM-AUI supports this convention.

The BPM-AUI is equipped with one FWD-I LED and one FWD-I LED, which are identical to those of the BPM-BNC (see Section 2.4.9). The BPM-AUI connector supports standard IEEE signals, which are summarized in Table 3.3.2 of Section 3.3.2.

2.4.10 BPM-FST

The Magnum BPM-FST is a multi-mode fiber optic local-bridge module equipped with a dual ST-type connector. It is self-learning and filters and forwards packets at full Ethernet wire speed. When used for 10BASE-FL segments, this module supports fiber optic transmission distances up to 2000m. For FOIRL, it supports fiber segments of up to 1000m in length. The BPM-FST includes full transceiver functionality and does not require an external transceiver device. The BPM-FST has three status LEDs. FWD-I and FWD-X

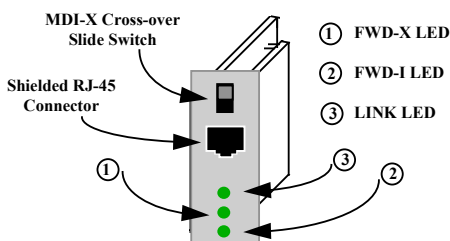


Magnum BPM-FST

are identical to those of the BPM-BNC (Section 2.4.9). In addition, this module has a GREEN LINK LED, that is always on when the link is operational.

2.4.11 BPM-TP

The Magnum BPM-TP card is equipped with a single RJ-45 connector and supports standard length Ethernet twisted pair segments. The RJ-45 connector is shielded to minimize emissions and allows both unshielded twisted pair



Magnum BPM-TP

(UTP) and shielded twisted pair (STP) segment connections.

The BPM-TP module is also equipped with a Media Dependent Interface-Crossover (MDI-X) slide switch to allow for cascaded connections. This feature eliminates the need for a special twisted pair crossover cable (see RPM-TP, 2.4.7).

The BPM-TP will support 10BASE-T unshielded twisted pair wiring (UTP) with maximum segment distances of 100m (325 ft.), or shielded twisted pair wiring (STP) of 150m (500 ft.). This module is designed with internal transceiver functionality. The status LEDs are the same as those of the BPM-FST (Section 2.4.10).

2.4.12 Special Option -- Second Bonus Port (Models 1016 and 1024)

In special cases, it may be desirable to configure the Magnum 1016 or 1024 Workgroup Hub with a second Port Module. The 1016 and 1024 Workgroup Hubs were designed to accommodate such a configuration, and the second Bonus Port may be configured by a trained technician and connected into header J1-RPM. In order to install a second PM, it is necessary to replace the factory-installed Basic AUI Port, connected into header J1, with the desired Port Module. This procedure requires a Port Module connector cable (ordered separately as part number PM-CBL, or equal), and is similar that of the Model 1008 change from a Basic AUI to a PM. Request special quote for factory installation of a second Port Module for Models 1016 and 1024.

NOTE: LEDs of the 2nd PM (connected in J1-RPM) may not be functional.

NOTE: Due to the Bridge Port Module functionality, **only one BPM** may be configured per Workgroup Hub.

2.5 Features and Benefits

■ Low cost, stand-alone 10BASE-T connectivity

Operating in a stand-alone environment as a self-sufficient network device, Magnum 1000 Workgroup Hubs offer a low cost method of providing small- to medium-size offices and workgroups access to standard Ethernet networking services.

■ Workgroup connectivity into a larger network

Magnum 1000 Workgroup Hubs provide a low cost method of providing workgroups with local networking services and also interconnection into a larger network via the up-link, the AUI port or the bonus port.

■ Rear Bonus Port Provides Connectivity or Local Isolation

The rear Bonus Port of the Magnum 1000 Workgroup Hubs may be optionally configured with any one of ten Magnum Port Modules. When configured with an RPM, the hub may be connected to any standard Ethernet media. Configuration with a BPM allows local-bridge isolation of the Magnum 1000 segment from the connected network.

■ Inter-operable with other Ethernet Devices

Magnum 1000 Workgroup Hubs are completely inter-operable with any Ethernet-compliant network device. Each Magnum 1000 Hub is fully compliant with IEEE 802.3 specifications for 10 Mbps CSMA/CD operation, allowing full Ethernet network compatibility.

■ Robust Network Operations

Magnum 1000 Workgroup Hubs use a "star" network topology and have automatic per port partitioning and re-connection. A faulty segment is isolated from the rest of the network, avoiding most network downtime.

■ LEDs Simplify Network Installation and Maintenance

Magnum 1000 Workgroup Hubs are equipped with front-mounted LEDs to provide status about basic network activity. The per port LINK LEDs offer a very simple way to verify connections at both ends of each attached twisted-pair cable.

■ Internal "Universal" Power Supply with Auto-ranging

An internal universal AC power supply allows any Magnum 1000 Workgroup Hub unit to be used throughout the world. The power cable attaches via a standard recessed IEC-type connector in the rear

2.6 Applications

Magnum 1000 Workgroup Hubs offer a great deal of flexibility and are easily used within a variety of Ethernet environments. Magnum Workgroup Hubs will often be used to support small- to medium-size networks operating in stand-alone configurations, as shown in Figure 2.6a. The number of users would likely not exceed twenty or so, including assorted network devices such as printers and servers.

Figure 2.6a: Magnum 1000 Workgroup Hub in stand-alone configuration.

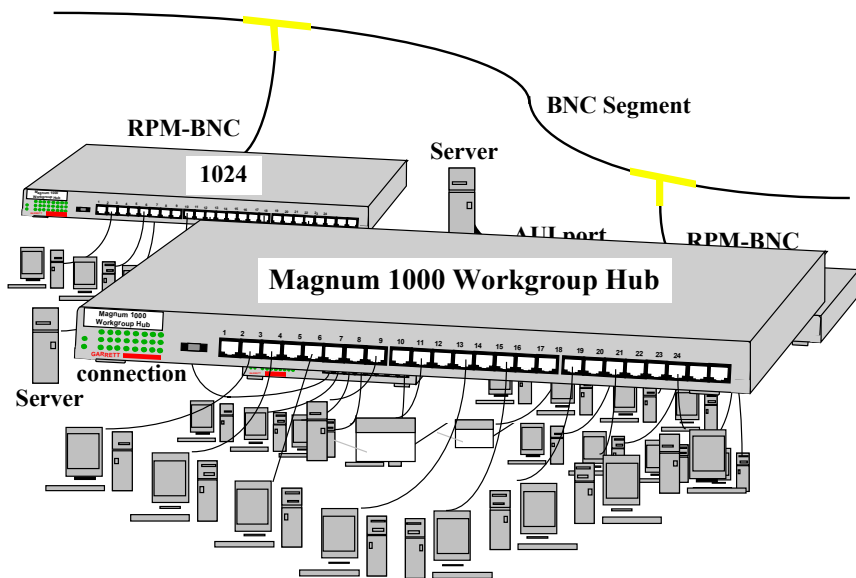


Figure 2.6b: Magnum 1000 Workgroup Hubs with backbone interconnections.

Magnum 1000 Hubs can also be used to extend an existing network of any standard Ethernet media. Figure 2.5b shows two workgroups connected to a ThinNet (10BASE2) segment. One of the workgroups is comprised of two Magnum 1000's cascaded by means of the up-link switch of a port 1 (for details on the up-link switch, refer to section 3.3.1, "Connecting Twisted Pair (RJ-45, Unshielded or Shielded). Each workgroup is connected to the ThinNet through a rear-mounted BNC-type RPM. In addition, the basic AUI port may be used to connect any standard device, such as the server shown in the figure above.

When network performance and bandwidth are an issue, Magnum 1000's can be configured with a Bridge Port Module, as shown in Figure 2.6c. In this diagram,

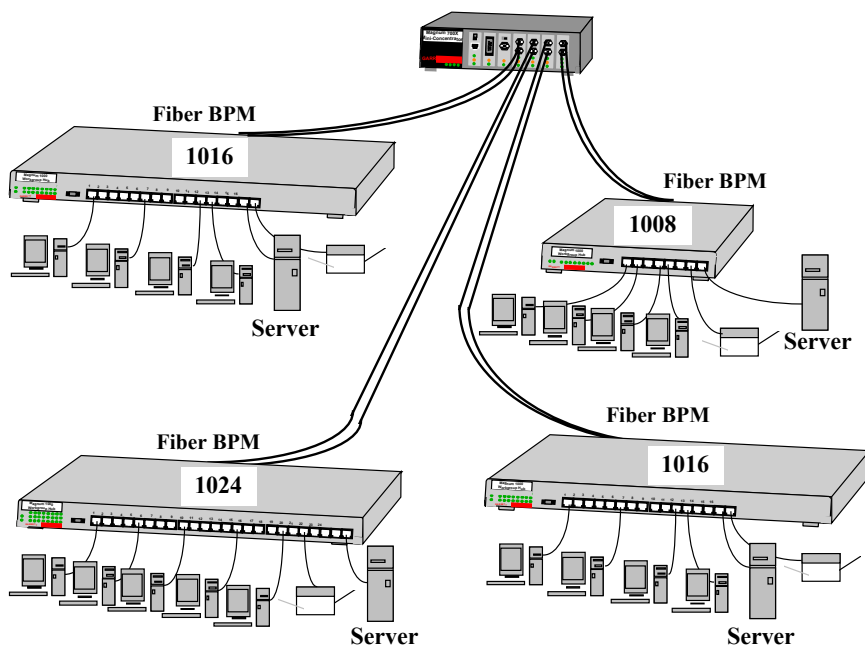


Figure 2.6c: Magnum 1000 Workgroup Hubs with local-isolation via rear BPMs.

each local-bridge-isolated workgroup is connected to a central concentrator through a BPM with a fiber connector. Since each workgroup has its own printer and server, most of the network traffic is kept local (i.e., is contained inside of each Magnum 1000 Hub segment by the BPMs) and does not consume bandwidth on the rest of the network. Refer to section 4.2, "Magnum 1000 BPM Local Bridge Functionality", for more information about the operation of the BPMs.

3.0 INSTALLATION

This section gives instructions for installing the Magnum 1000 Workgroup Hubs, and for connecting the various Ethernet media.

3.1 Table-Top or Rack-Mount

Installation of a Magnum 1000 Workgroup Hub is a very simple procedure. Magnum hubs are easily mounted in a rack or on a table-top. When properly installed, the front-mounted LED status indicators should be in plain view and easy to read.

Rack mounting installation requires a special rack-mount bracket. (This is included with models 1016 and 1024. For model 1008, order part # 1008-RMB.) The brackets easily attach to the hub, which is then installed in any standard 19 inch rack.

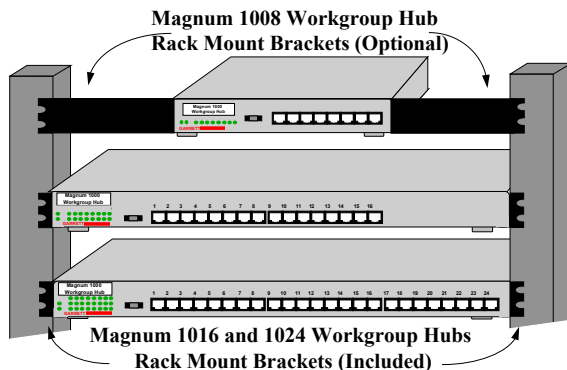


Figure 3.1: Magnum 1000's,

Rack-mount Brackets

3.2 Powering the Magnum 1000 Workgroup Hub

Magnum 1000 Workgroup Hubs incorporate an internal universal power supply, and have a recessed male IEC connector for the AC power cord at the right-rear. A six-foot 115 VAC 60 Hz power cord is supplied with each unit shipped within the United States and Canada.

Each Magnum 1000 Workgroup Hub's auto-ranging power supply supports installation environments where the AC voltage is from 90 to 260 volts with a power input frequency between 47 and 63 Hz, and will consume a maximum of 20 watts (estimated). In order to power down the unit, simply unplug either end of the power cable.

When connecting various Ethernet media, there is no need to power down the unit. Individual segments of any media type can be connected or disconnected without concern for AC power-related problems or damage to the unit.

3.3 Ethernet Media Connections

The Magnum 1000 workgroup Hub may be used as a stand-alone hub serving the needs of a small to medium size workgroup or may be connected to a larger network environment. In either case, user connectivity is achieved using twisted pair wiring, Cat. 3 or Cat 5, UTP or STP. There may be some cases where a user device will be connected via the AUI or Bonus Port.

In applications where Magnum hubs are used to provide workgroup services within a larger network system, the rear port(s) may be connected into a larger network, rather than being used to connect to a user.

The various media types supported and their corresponding IEEE 802.3 standards and connector types are as follows:

<u>Media</u>	<u>IEEE Standard</u>	<u>Connector</u>	<u>PM type</u>
ThinNet	10BASE2	BNC	RPM-BNC, BPM-BNC
ThickNet	10BASE5	AUI (female)	RPM-AUI, BPM-AUI
Drop Cable	10BASE5	DTE (male)	RPM-DTE
Twisted Pair	10BASE-T	RJ-45	RPM-TP, BPM-TP
Fiber (mm ¹)	FOIRL	ST	RPM-FST, RPM-SMF, BPM-FST
Fiber (mm ¹)	10BASE-FL	ST or SC	RPM-FST, RPM-SMF, BPM-FST
Fiber (sgl.m ²)	*	ST	RPM-SMF

¹ mm = multi-mode

² sgl.m = single-mode

* 10 Mb operation not currently standardized by IEEE

Instructions for connecting the Magnum 1000 Workgroup Hub to each of the standard Ethernet types are given below.

3.3.1 Connecting Twisted Pair (RJ-45, Unshielded or Shielded)

The following procedure describes how to connect a 10BASE-T twisted pair segment to the RJ-45 port on the front panel of the hub or to the RPM-TP or BPM-TP. The procedure is the same for both unshielded and shielded twisted pair segments.

1. Using standard 10BASE-T media, insert either end of the cable with an RJ-45 plug into the RJ-45 connector. Note that, even though the TP connector is shielded, either unshielded or shielded 10BASE-T cables and wiring may be used.
2. Connect the other end of the cable to the corresponding device.
3. When proper connection and power have been established, the port's LINK LED will illuminate GREEN.

NOTE: **Port 1** of the Magnum 1000 Workgroup Hub (and the Magnum **RPM-TP** and **BPM-TP**) are equipped with a cross-over slide switch to accommodate repeater-to-repeater connections without special cross-over connectors.

Set the slide switch to the “left” (for port 1) or “down” (for PM-TP) position for normal twisted pair cable segments from the hub port to a user device. Set the slide switch to the “right” (port 1) or “up” (for PM-TP) position for cascaded or up-link segment connections to another repeater or hub in the network. Verify proper switch position by noting that the port’s LINK LED will illuminate when proper link is established.

3.3.2 Connecting ThickNet 10BASE5 (AUI)

Using the steps below as a guide, attach a new or existing 10BASE5 ThickNet drop-cable directly to the AUI connector on the rear of the Magnum 1000 Workgroup Hub or on the RPM-AUI or BPM-AUI port.

1. Plug the male end of the cable into the female AUI connector on the Magnum 1000 or PM-AUI card.
2. Engage the AUI connector slide lock to insure maximum connectivity.
3. Connect the opposite end of the cable into a network AUI port. (This could be a network backbone transceiver, a hub or fan-out with an AUI port, or an AUI Port Module in a concentrator.)

The AUI port may also be used for connecting to other Ethernet devices using standard AUI cabling. In this type of situation, it is important to consider the AUI segment length to the attached device, including any cascading.

The maximum transmission distance between a backbone transceiver equipped with an AUI connector and the AUI port of the Magnum 1000 will vary. According to Ethernet standards, when an AUI cable is used to connect the Magnum 1000 directly to a backbone transceiver, the maximum AUI segment length of 50m (165 ft.) is allowed. If the Magnum 1000 is connected to a transceiver that has been cascaded from another transceiver, the maximum AUI segment length is reduced as stated below.

Important Note: The maximum transmission distance is decreased by 6m (20 ft.) for every additional level of network transceiver device "dropped" or "cascaded" from the original backbone transceiver tap.

The RPM-AUI connector supports standard IEEE signals, which are summarized in Table 3.3.2.

Table 3.3.2: AUI Pin Assignments

Pin	Function	Pin	Function
1	Control In Circuit Shield	10	Data Out Circuit B
2	Control In Circuit A	11	Data Out Circuit Shield
3	Data Out Circuit A	12	Data In Circuit B
4	Data In Circuit Shield	13	Voltage Plus (+)
5	Data In Circuit A	14	Voltage Shield
6	Voltage Common	15	Control Out Circuit B
7	Control Out Circuit A	SHELL	Protective Ground
8	Control Out Circuit Shield (conductive shell)		
9	Control In Circuit B		

- NOTES:**
- 1) Voltage Plus (pin #13) and Voltage Common (pin # 6) use a single twisted pair in the AUI cable.
 - 2) Pins 4, 8, 11 and 14 may be connected to pin #1.

3.3.3 Connecting ThinNet 10BASE2 (BNC)

Connect the ThinNet coax cable to the BNC connector on the Magnum RPM-BNC or BPM-BNC card in the same manner as is done for any standard BNC connection. The PM-BNC port is specially equipped with an internal termination switch on the front of the card (see Section 4.1 for a description of this switch). This eliminates the need to use a "tee" connector when the BNC cable is ending at the connection to this PM. Some applications may require a "tee" connector, used as a tap, to allow the 10BASE2 coax segment to continue on past the PM-BNC connection.

3.3.4 Connecting Drop Cable 10BASE5 (DTE)

Using the steps below as a guide, attach the 10BASE5 drop-cable directly to the DTE connector on the RPM-DTE port.

1. Plug the female end of the cable into the male DTE connector on the RPM-DTE card.
2. Engage the AUI connector slide lock (on the cable) to insure maximum connectivity.
3. Connect the opposite end of the cable into a network AUI port. (This could be a server, router, bridge, hub, or UNIX workstation.)

3.3.5 Connecting Fiber Optic 10BASE-FL and FOIRL (ST-type, "Twist-Lock")

The following procedure applies to FOIRL and 10BASE-FL applications using an RPM-ST or BPM-ST card with ST-type fiber connectors. (The primary difference between FOIRL and 10BASE-FL for users is the maximum distance allowed. 10BASE-FL is used for a fiber segment length of up to 2000m, while FOIRL is used for fiber segments of up to 1000m in length.)

1. Before connecting the fiber optic cable, remove the protective dust caps from the tips of the connectors on the PM-ST. Save these dust caps for future use.

2. Wipe clean the ends of the dual connectors with a soft cloth or lint-free lens tissue dampened in alcohol. Make certain the connectors are clean before connecting.

Note: **One strand of the duplex fiber optic cable is coded using color bands at regular intervals; you must use the color-coded strand on the associated ports at each end of the fiber optic segment.**

3. Connect the Transmit (TX) port (light colored post) on the Magnum PM-FST to the Receive (RX) port of the remote device. Begin with the color-coded strand of the cable for this first TX-to-RX connection.
4. Connect the Receive (RX) port (dark colored post) on the PM-FST to the Transmit (TX) port of the remote device. Use the non-color coded fiber strand for this.
5. The LINK LED on the front of the PM-FST will illuminate when a proper connection has been established at both ends (and when power is ON in the unit). If LINK is not lit after cable connection, the normal cause is improper cable polarity. Swap the fiber cables at the Port Module connector to remedy this situation.

3.3.6 Connecting Fiber Optic (SMA-type, "Screw-on")*

The same five-step procedure as for fiber ST-type applies to FOIRL and 10BASE-FL applications using an RPM-SMA card used with SMA-type fiber connectors. Follow the five steps as described in the Section 3.3.5 above.

When connecting fiber media to SMA connectors, do not over-tighten but rather simply "finger tighten" these connections. Do not use a heavy tool (such as a wrench) to tighten the fiber optic connectors as this might cause damage and result in operating problems. *Improper and excessive tightening may impair data transmission.*

*** The RPM-SMA is only available via special order.**

3.3.7 Connecting Single-Mode Fiber Optic (SMF)

When using the RPM-SMF, be sure to use single-mode fiber cable. Single-mode fiber cable has a smaller diameter than multi-mode Fiber cable (2/15 - 8/60 microns for single-mode, 50/125 or 62.5/125 microns for multi-mode where xx/xx are the diameters of the core and the core plus the cladding respectively). Because of this, single-mode fiber allows full bandwidth at longer distances, and may be used to connect nodes up to 10 Km apart. For operation with standard half-duplex Ethernet, collision domain and / or power budget limitations may apply for distances over 5Km. Check your single-mode configuration with an experienced network designer when you use extended distances.

The same five-step procedure for multi-mode fiber ST-type applies to single-mode fiber connectors. Follow the five steps listed in Section 3.3.5 above.

3.3.8 Power Budget Calculations for Magnum 1000 Series RPM’s with Fiber Media

Receiver Sensitivity and Transmitter Power are the parameters necessary to compute the power budget. To calculate the power budget of different fiber media installations using Magnum products, the following equations should be used:

OPB (Optical Power Budget) = P_T(min) - P_R(min)

where P_T = Transmitter Output Power, and P_R = Receiver Sensitivity

Worst case OPB = OPB - 1dB(for LED aging) - 1dB(for insertion loss)

Worst case distance = {Worst case OPB, in dB} / [Cable Loss, in dB/Km]

where the “Cable Loss” for 62.5/125 and 50/125μm (M.m) is 2.8 dB/km,
and the “Cable Loss” for 100/140 (Multi-mode) is 3.3 dB/km,
and the “Cable Loss” for 9/125 (Single-mode) is 0.5 dB/km

The following data has been collected from component manufacturer’s (HP’s and Siemens’) web sites and catalogs to provide guidance to network designers and installers.

Fiber Port Module	Speed, Std.	Mode	Std. km fdx (hdx)	Wave - length nm	Cable Size μm	X'mitr Output P _T , dB	R'civr Sens. P _R , dB	Worst OPB, dB	Worst* distance Km, fdx	typical OPB, dB	typical* distance Km, fdx
RPM-MST, MSC	10 Mb FL	Multi-mode	2 (2)	850	62.5/125 100/140 50/125	-15.0 -9.5 -19.5	-31 -31 -31	14 19.5 9.5	5 5.9 3.4	17 23.5 13.5	6 7 4.8
RPM-SMF (ST)	10 Mb FL	Single-mode	10 (5)	1300	9/125	-30	-39	7	14	13	26

** Note: The use of either multi-mode or single-mode fiber to operate at 100Mbps speed over long distances (i.e., in excess of approx. 400 meters) can be achieved **only** if the following factors are both applied:*

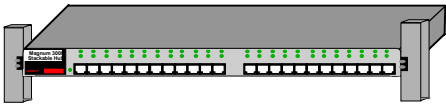
- The 100Mb fiber segment must operate in full-duplex (FDX) mode, i.e. the full-duplex (factory default) setting for 100Mbps fiber ports must be used, and*
- The worst-case OPB of the fiber link must be greater than the fiber cable’s passive Attenuation.*

(Attenuation = Cable loss + LED aging loss + Insertion loss + safety factor)

3.3.9 Rack-mounting

Installation of a Magnum 1000 Series Hub in a 19” rack is a simple procedure. The units are 1U

(1.75”) high. When properly installed, the front-mounted LED status indicators should



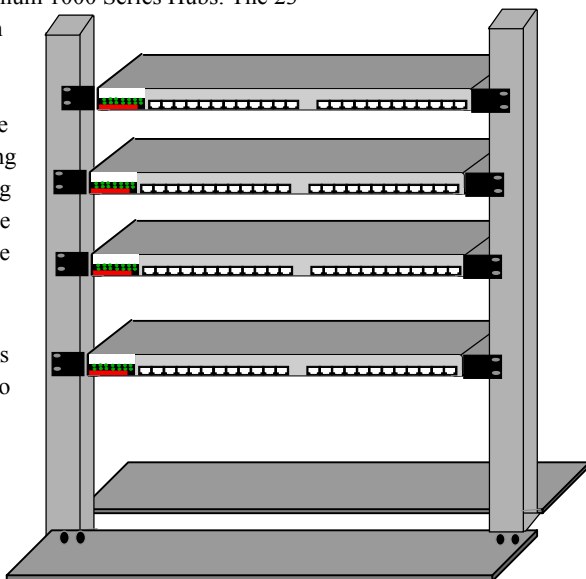
be in plain view and easy to read. Rack-mount installation requires special rack-mounted brackets and screws (included with each 1000 series unit). The brackets attach to the front sides of the Hub, which is then fastened into a standard 19" rack.

The 23" brackets and ETSI brackets are also available (optional) for Rack-mounting purpose with Magnum 1000 Series Hubs. The 23" brackets are more popular in TELCO Industry and consider as a standard for Rack-mounting purpose. The 23" brackets are mainly being used for Huge rack-mounting frame to provide more secure and stability to the unit in the TELCO industry.

The ETSI (European standard) brackets are moreover looks similar to the 23"

brackets and mostly used in the ETSI standard industry. The optional 23" brackets and the ETSI brackets come in a package along

with the necessary screws for the convenient to the customer.



4.0 OPERATION

The Magnum 1000 Workgroup Hubs operate as full-function Ethernet repeaters. They are compliant with IEEE 802.3 specifications for CSMA/CD 10 Mbps operation, and support standard IEEE defined media inclusive of 10BASE-T, 10BASE-FL, FOIRL, 10BASE2, and 10BASE5. The following describes the basic functionality.

4.1 Magnum 1000 Repeater Functionality

Repeater Functionality: Each hub port operates in conjunction with the controller functions of the Magnum 1000 Hub's base unit, functioning together as a fully compliant Ethernet repeater.

Collisions: When carrier is detected simultaneously on multiple ports, a jam pattern is generated on each port to create a collision condition. When a collision signal from one port is detected, it generates a jam pattern to the other ports.

Partitioning and Re-Connection: Magnum 1000 Hubs will automatically partition any port where 32 consecutive collisions occur or after 6.5 milliseconds (msec) of continuous transmissions. Network integrity is checked every 800 msec and segment re-connection occurs after one 512-bit packet is transmitted without an error.

Fragment Extension: Magnum 1000 Hubs will automatically add bits to a received data packet of less than 96 bits (a "fragment") so that the minimum output packet to the other port is 96 bits long.

Preamble Regeneration: Magnum 1000 Hubs will add bits to the preamble so that the output packet contains a minimum of a 64-bit preamble.

Status LEDs: Each Magnum 1000 Workgroup Hub is designed with front panel LEDs to allow for quick visual assessment of the operational condition of the hub and the network. Each Magnum 1000 Hub is equipped with PWR, ACT, and LINK LEDs. Bonus Port RPMs are also equipped with status LEDs (see Section 2.4).

PWR LED: Illuminates GREEN to indicate proper operation of the internal power supply.

ACT LED: Illuminates GREEN to indicate "activity", i.e., that the hub is processing network packets. Normally flashes to indicate data traffic.

LINK LEDs: Illuminates GREEN when connectivity is established between the hub and the attached device. Each RJ-45 port is represented by its own LINK LED. LINK should always be on during normal operation. LINK is OFF if connectivity or power is lost anywhere along the segment.

4.2 Magnum 1000's with BPM Local Bridge Functionality

When configured with a BPM, a Magnum 1000 Workgroup Hub and its attached devices are bridge-isolated from the network segment connected through the BPM. The bridge functionality of the BPM bridge modules is described here.

1. Bridge Functions: Each BPM card contains a compact local bridge module which filters and forwards packets at full Ethernet wire speed. These micro-bridges are self learning and have small (256 user) address tables.

Packet filter/forward decisions are made based on whether the packet source is internal (originates within the local Magnum 1000) or external (originates from upstream on the attached segment). If the packet's source is internal, it is forwarded to the outside only if the destination address is not in the address table. Figure 4.2a shows an internal packet being forwarded to the external segment.

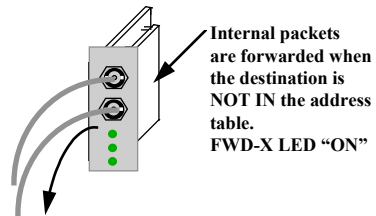


Figure 4.2a: Internal

Packet Forwarded

Figure 4.2b show the cases where an internal packet is filtered. When the packet's source is external, it is forwarded to the inside only if the destination address is in the address table.

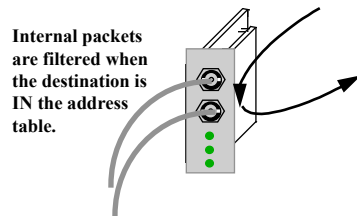
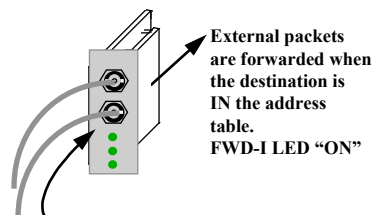


Figure 4.2b: Internal Packet Filtered

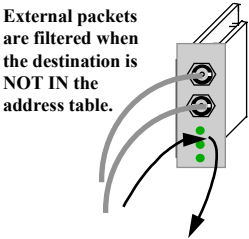
The filter/forward handling of external packets are shown in figures 4.2c and 4.2d respectively. When an internal packet's source address is not already in the address table, it is written



there. This happens when a node first sends **Figure 4.2c: External Packet Forwarded**

a packet upon bridge initialization.

Note, therefore, that the address table learns only internal addresses, i.e., those connected via the inside of the local Magnum 1000, a number typically well under the 256 table addresses size. Should the table become full, the BPM will clear all entries in the table by reinitializing itself.



When

an external packet's source address

is in the address table, it is purged. **Figure 4.2d: External Packet Filtered**

This can occur if a node has physically moved to a different location.

A summary of the filtering, forwarding, and address table maintenance performed by the BPMs is shown in Table 4.2.

Table 4.2: BPM Functionality

<u>Packet Source</u>	<u>Source Address</u>	<u>Destination Address</u>	<u>Address Table Maintenance</u>	<u>Filter/Forward Action</u>
Internal	Not in table	Not in table	Add source to table	Forward
Internal	Not in table	In table	Add source to table	Filter
Internal	In table	Not in table	Nothing	Forward
Internal	In table	In table	Nothing	Filter
External	Not in table	Not in table	Nothing	Filter
External	Not in table	In table	Nothing	Forward
External	In table	Not in table	Purge source from table	Filter
External	In table	In table	Purge source from table	Forward

2. Throughput Increase: By using a BPM to isolate a user group segment having significant local traffic, it is possible to increase overall network throughput. For example, a segment containing a group of workstations and servers may have heavy local traffic, but only a small amount of traffic that is

directed outside the segment. A BPM connecting this segment to the rest of the network, as shown in Figure 4.2e, will keep the local segment traffic isolated from the rest of the network, thus increasing the effective bandwidth on both the local segment and the rest of the network.

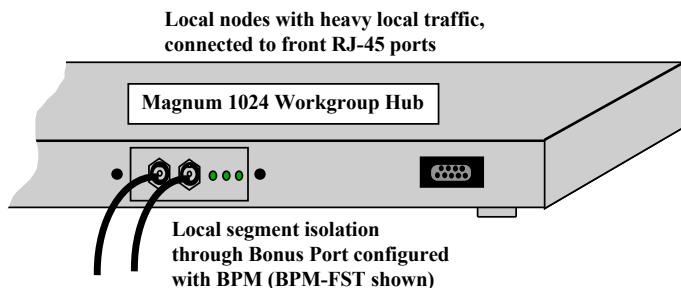


Figure 4.2e: Local Segment Isolation with a Bridge Port Module (BPM)

3. Bridge Transparency: The BPMs are transparent to both the users and the application software.

4. LINK and Traffic Status: The Magnum BPM-TP and BPM-FST indicate link integrity with an LED. This LINK LED is normally lit. An unlit LINK LED indicates a broken cable or loss of power at some point in the segment. All BPMs have FWD-I and FWD-X status LEDs. The FWD-I LED flashes when packets are forwarded into the local segment. The FWD-X LED flashes when packets are forwarded out of the local segment.

5. Self-test Diagnostics: A Magnum BPM requires 15 seconds upon power-up before bridging services are available. During this time, the BPM performs an internal self-test.

4.3 Power Requirements

Magnum 1000 Hubs are designed with internal auto-ranging AC power supply units for efficiency and for simplicity of installation and operation. See Section 3.2, "Powering the Magnum 1000 Workgroup Hub" for detailed information on the AC power needed. See Section 1.1, "Technical Specifications: Power Supply (Internal)" for detailed information on the internal power supply units.

For optional 48VDC internal power supply information, see Appendix B.

5.0 TROUBLESHOOTING

All Magnum Ethernet products are designed to provide reliability and consistently high performance in all network environments. The installation of Magnum 1000 series workgroup hub is a straightforward procedure (see INSTALLATION, Section 2.6); the operation is also straightforward and is discussed in Section 4.

Should problems develop during installation or operation, this section is intended to help locate, identify and correct these types of problems. Please follow the suggestions listed below prior to contacting your supplier. However, if you are unsure of the procedures described in this section or if the Magnum 1000 series workgroup hub is not performing as expected, do not attempt to repair the unit; instead contact your supplier for assistance or contact GarrettCom Customer Support.

5.1 Before Calling for Assistance

1. If difficulty is encountered when installing or operating the unit, refer back to the Installation Section of the applicable chapter of this manual. Also check to make sure that the various components of the network are interoperable.
2. Check the cables and connectors to ensure that they have been properly connected and the cables/wires have not been crimped or in some way impaired during installation. (About 90% of network downtime can be attributed to wiring and connector problems.)
3. Make sure that an AC power cord is properly attached to each Magnum 1000 series workgroup hub unit. Be certain that each AC power cord is plugged into a functioning electrical outlet. Use the PWR LEDs to verify each unit is receiving power.
4. If the problem is isolated to a network device other than the Magnum 1000 series workgroup hub product, it is recommended that the problem device is replaced with a known good device. Verify whether or not the problem is corrected. If not, go to Step 5 below. If the problem is corrected, Magnum 1000 series workgroup hub and its associated cables are functioning properly.
5. If the problem continues after completing Step 4 above, contact your supplier of the Magnum 1000 series workgroup hub unit or if unknown, contact GarrettCom, Inc. by fax, phone or email (*support@garrettcom.com*) for assistance.

5.2 When Calling for Assistance

Please be prepared to provide the following information.

1. A complete description of the problem, including the following points:
 - a. The nature and duration of the problem;
 - b. Situations when the problem occurs;
 - c. The components involved in the problem;
 - d. Any particular application that, when used, appears to create the problem;
2. An accurate list of GarrettCom product model(s) involved, with serial number(s). Include the date(s) that you purchased the products from your supplier.
3. It is useful to include other network equipment models and related hardware, including personal computers, workstations, terminals and printers; plus, the various network media types being used.
4. A record of changes that have been made to your network configuration prior to the occurrence of the problem. Any changes to system administration procedures should all be noted in this record.

5.3 Return Material Authorization (RMA) Procedure

All returns for repair must be accompanied by a Return Material Authorization (RMA) number. To obtain an RMA number, call GarrettCom Customer Service at (510) 438-9071 during business hours in California or email to support@garrettcom.com). When calling, please have the following information readily available:

Name and phone number of your contact person.

Name of your company / institution

Your shipping address

Product name

Serial Number (or Invoice Number)

Packing List Number (or Sales Order Number)

Date of installation

Failure symptoms, including a full description of the problem.

GarrettCom will carefully test and evaluate all returned products, will repair products that are under warranty at no charge, and will return the warranty-repaired units to the sender with shipping charges prepaid (see Warranty Information, Appendix A, for complete details). However, if the problem or condition causing the return cannot be duplicated by GarrettCom, the unit will be returned as:

No Problem Found.

GarrettCom reserves the right to charge for the testing of non-defective units under warranty. Testing and repair of product that is not under warranty will result in a customer (user) charge.

5.4 Shipping and Packaging Information

Should you need to ship the unit back to GarrettCom, please follow these instructions:

1. Package the unit carefully. It is recommended that you use the original container if available. Units should be wrapped in a "bubble-wrap" plastic sheet or bag for shipping protection. (You may retain all connectors and this Installation Guide.)

CAUTION: Do not pack the unit in Styrofoam "popcorn" type packing material. This material may cause electro-static shock damage to the unit.

2. Clearly mark the Return Material Authorization (RMA) number on the outside of the shipping container.
3. GarrettCom is not responsible for your return shipping charges.
4. Ship the package to:

GarrettCom, Inc.

213 Hammond Ave.

Fremont, CA 94539

Attn.: Customer Service

APPENDIX A: WARRANTY INFORMATION

GarrettCom, Inc. warrants its products to be free from defects in materials and workmanship for a period of three (3) years from the date of shipment by GarrettCom.

During this warranty period, GarrettCom will repair or, at its option, replace components in the products that prove to be defective at no charge other than shipping and handling, provided that the product is returned pre-paid to GarrettCom.

This warranty will not be effective if, in the opinion of GarrettCom, the product has been damaged by misuse, misapplication, or as a result of service or modification other than by GarrettCom.

GarrettCom reserves the right to make a charge for handling and inspecting any product returned for warranty repair which turns out not to be faulty.

Please complete the warranty card as this acts as a product registration, and mail it to GarrettCom within two weeks of your purchase.

APPENDIX B : Internal DC Power Supply Option

B1.0 SPECIFICATIONS - FOR MAGNUM 1000 WORKGROUP HUBS

Power Supply (Internal -48 VDC Option)

DC Power Connector: 3 terminals: “-“, “GND”, “+”

Input Voltage: 36 - 70 VDC (auto-ranging)

Power Consumption: Magnum 1000's Hubs: 10 watts typical,
20 watts max. P.S. rating

Power Supply (Internal 24 VDC Option)

DC Power Connector: 3 terminals: “-“, “GND”, “+”

Input Voltage: 20 - 40 VDC (auto-ranging)

Power Consumption: Magnum 1000's Hubs: 10 watts typical,
20 watts max. P.S. rating

Power Supply (Internal 125 VDC Option)

DC Power Connector: 3 terminals: “-“, “GND”, “+”

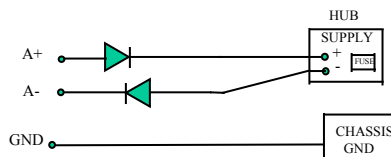
Input Voltage: 120 - 160 VDC (auto-ranging)

Power Consumption: Magnum 1000's Hubs: 10 watts typical,
20 watts max. P.S. rating

With the exception of the power supply, all specifications and functions of Magnum 1000 Workgroup Hubs-48VDC, 24VDC & 125VDC models are identical to those listed in the main manual.

B2.0 -48VDC, 24VDC & 125VDC POWER OPTION, THEORY OF OPERATION

The -48VDC, 24VDC & 125VDC power option is designed using diodes inside on each DC power input line behind the two external power connection terminals, so that the power from an external source can only flow into the hub. This allows the hub to operate only whenever DC power is correctly applied to the two inputs. It protects the hub from incorrect DC input connections. An incorrect polarity connection, for example, will neither effect the hub, nor its power supply internally, nor will it blow the fuse in the internal power supply.



Disconnecting the power source is used for powering the hub on and off when it is placed into or taken out of service.

B3.0 APPLICATIONS

Magnum 1000 Workgroup Hubs are easily installed in a variety of applications where -48VDC, 24VDC & 125VDC power is used as the primary power source. The -48VDC, 24VDC & 125VDC power configuration provides an Ethernet networking solution utilizing a special DC internal power supply in hubs having a proven reliability record.

The solution is particularly useful in the telecommunication industry, where it is common for facilities to operate on -48VDC power. Such companies include regular and wireless telephone service providers, Internet Service Providers (ISPs), other communication companies, and firms supplying network management and operations monitoring equipment. In addition, many high-availability equipment services, such as in broadcasters, publishers, heavy industrial plants, brokerage firms and others, often use a battery backup system to maintain operations in the event of a power failure.

The 24VDC & 125VDC solution are particularly useful in the Industrial environment, where it is common facilities to operate on 24VDC & 125VDC power. The 125VDC solution is mainly used in Utilities Industries, such as Electric substation, Electrical generating plant etc. Whereas 24VDC application is mainly in the Industrial environment, such as chemical plants, paper mill, stone quarrying plant, wastewater treatment Plant etc

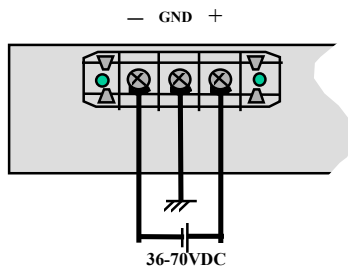
B4.0 INSTALLATION

This section describes the installation of the -48VDC, 24VDC & 125VDC power source leads to the -48VDC, 24VDC & 125VDC power terminal block on the Magnum 1000's. (see figure below).

Figure B4.1: -48VDC Terminal Block on Magnum 1000's-48VDC

The -48VDC, 24VDC & 125VDC terminal block on the Magnum 1000's is located on the rear of the unit and is equipped with three (3) screw-down lead posts. The leads

are identified as negative (-), positive (+), and chassis ground (GND). The connection procedure is straightforward. Simply connect the DC leads to the Switch's power terminals, positive (+) and negative (-) screws. The use of Ground (GND) is optional; it connects to the Switch chassis. Ensure that each lead is securely tightened.



Note: *Before connecting to Terminal Block of -48VDC, 24VDC or 125VDC, always use a digital voltmeter to measure the output voltage of the power supply and determine the lead which is more “+ve potential Lead”. The more “+ve” voltage terminal lead from 48V or -48V Power supply must be connected to the post labeled “+”.*

The GND can be hooked at the last.

Disconnecting the DC power source is used to remove the unit from service, and as a power-down to RESET the hub’s electronics if needed.

B4.1 UL Requirements

1. *Minimum 14 AWG cable for connection to a Centralized DC power source.*
2. *Fastening torque of the lugs on the terminal block: 9 inch pound max.*
3. *Centralized DC Power Source cable securement, use at least four cable ties to secure the cable to the rack at least 4 inches apart with the first one located within 6 inches of the terminal block.*

B5.0 OPERATION

Operation of the Magnum 1000’s with the optional -48VDC, 24VDC & 125VDC power supply is identical to that of the standard AC-powered models.

B6.0 ORDERING INFORMATION

To order the optional -48VDC power supply factory installed, add a suffix of “-48VDC” after the product’s standard model #. Example: **Magnum 1016-48VDC**.

Similarly for “24VDC”: **Magnum 1016-24VDC**.

B7.0 TROUBLESHOOTING

Please refer to Section 6.0 for troubleshooting